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**XXVIII.** *Thoughts on the different Impregnation of Mineral Waters ; more particularly concerning the Existence of Sulphur in some of them, by John Rutty, Doctor of Physic.*

Read Nov. 15, 1759. **I**NASMUCH as the existence of sulphur in waters hath been doubted, not only by Lister and Hoffman, but by another author, that has lately appeared, to whom the public has been, in some measure, indebted for exploding sulphur from some waters, on which it had been too liberally, and without the due evidence of experiment, attributed ; I have therefore thought it worth while to review, collect, and sum up, the evidences of sulphur in waters, in order to shew, not only that antiquity hath not altogether rashly attributed sulphur to waters, but how far the existence of that mineral is demonstrable to sense in several, and more especially the cold, waters of that denomination.

1. That the feter of these waters is not owing to mere stagnation ; and that they possess something more than what common water acquires by putrefaction, appears not only from Dr. Short's observation of some of these having a full and brisk current, but because putrid rain-water, and many of our chalybeate waters, turned putrid by keeping, do not discolour metals, as these waters do.

2. The effects of these waters, and their vapours, in discolouring metals, and their peculiar smell and flavour, like that of boiled eggs, and in the stronger like that of rotten eggs, are perfectly similar to those

of the artificial solution of sulphur, and its vapours.

3. Many of these waters, both foreign and domestic, are found to contain the native alkaline salt, which is the proper menstruum for, and has the same effect in, dissolving sulphur, as the artificial alkali; viz. not only the hot waters of Aix la Chapelle and Borsel, but the cold of Geronsterre; and, in England, those of Chadlington, Nottingham, Bilton, Quincamel, Sutton-bog, and Wiggleworth; and the following in Ireland, viz. those of Swadlingbar, Derrylester, Lisblenk, Ashwood, Derryherce, Anaduff, Aghaloo, and one lately discovered at Lucan near Dublin.

4. Accordingly a milkiness, or incipient precipitation, analogous to lac sulphuris, is produced in several of these waters, by dropping acids into them; particularly in those of Aix la Chapelle, even according to Dr. Lucas's own testimony of the effects of distilled vinegar on it, and in that of Moffat in Scotland; of Harrigate; in our Swadlingbar water, and another of our springs of this sort in the C. Fermanagh: and to this add the white hairy mucus ordinarily precipitated on the sticks, or grass, in the passage of these waters, analogous to a magistery of sulphur.

5. The sulphur in waters is in a most highly attenuated, subtil, and fugitive, state; insomuch that, as Dr. Lucas observes of those of Aix la Chapelle, there is a great alteration in the colour of the precipitate caused by solution of silver in that, which hath been immediately drawn from the source, and that which has lain by only twenty seconds, even in a bottle filled, and close stopp'd; so soon is it lost or dissipated: and moreover, it is also blended with other minerals;

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so that it is no wonder it should be difficult to exhibit a palpable sulphur, and that the distinguishing appearances proper to that mineral should often fail, particularly the above-mentioned test by acids, and the burning blue.

6. That a real sulphur, or bituminoso-sulphureous substance, is dissolved in these waters, and subsists in some of their less volatile or more fixed parts, is evident from the following appearances in the mud and scum collected from several of them : for the mud of several of the cold waters I have called sulphureous, as well as that of several hot baths in Germany and Hungary, mentioned by Browne in his Travels, is variegated with the several colours of yellow, green, and red, as the real sulphur, and, in some experiments, burnt with a blue flame, and a sulphureous smell ; and the like evidences may be given of the sulphureous quality of the scum of divers of our cold waters, particularly in that of Mechan, in the north of Ireland, which, being dried, exhibited on the upper side a whitish yellow, or cream-colour ; but underneath a deep grass-green, a pale, beautiful gold-colour, and a light reddish pink-colour, interspersed in a substance of a leaden blackish colour ; every colour excellent in its kind, and as slippery as frogs spawn : varieties of colours, like these, being also found in the preparation of lac sulphuris variously exposed to the air. But, to come to more direct proofs, we are assured, in Short's first volume of his History of mineral waters, as to the cold waters of Harrigate, that both the mud and scum burnt with a blue flame, and smelt strong of sulphur ; and that great quantities of yellow sublimed flowers of sulphur  
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have been found under the basons of that well. And Dr. Peter Shaw affirms, that real brimstone, even found to be so by proper trials, hath been seen floating in the water like feathers, and separable by bare straining: and to all this agrees the observation I have frequently made on several of these cold waters, viz. certain light purple-coloured pellicles are frequently found floating in them, which, being dried, sparkle, flame, and stink, on the red-hot iron. But, to conclude, the operation and effects of several of these our cold waters, altogether similar to those of sulphur, abundantly confirm their impregnation with that mineral.

Thus it appears, that sulphur is not confined to the hot baths of Aix la Chapelle, and a few more abroad, but is found also in the cold waters of both England and Ireland; and as these have, of late years, been subjected to a minute examination, I shall subjoin a brief comparison between the one and the other from experiment and observation: thus,

1. Is the smell of the waters of Aix la Chapelle like that of the washings of a foul gun, or like that of the solution of sulphur in an alkaline lye? So is that of our cold waters called sulphureous.

2. Do Aix la Chapelle waters, taken from their source, turn silver of a gold-colour, and blackish; and with its solution, and that of sugar of lead, exhibit a dark-coloured precipitation? So do our waters called sulphureous.

3. Does Aix la Chapelle water, on dropping distilled vinegar into it, exhibit a milkiness, analogous to lac sulphuris? So divers of the cold waters above-mentioned do also exhibit a white cloud with other acids.

4. Do

4. Do the waters of Aix la Chapelle and Borsfel contain an alkaline salt? So do many of our cold waters above enumerated.

5. Is silver, borne in the pockets during a course of Aix la Chapelle waters, tarnished? The like effect hath been observed in several of our cold waters.

6. Do the waters of Aix la Chapelle yield flowers of sulphur? and do some of the springs of Borsfel precipitate a magistery of sulphur? The like hath been observed in some of our cold waters above enumerated.

7. Are the baths of Aix la Chapelle of known efficacy in the cure of the itch, impetigo, vitiligo, and ulcers? So are the cold waters above enumerated, as appears from the signal successes, which have attended their use, even in some of the most inveterate and rebellious disorders of this kind.

Is there any rashness then in concluding, that these our cold waters do also contain sulphur substantially dissolved in them, and differ from the hot ones of Aix la Chapelle and Borsfel in nothing but heat, and the different proportions of impregnating minerals of the same quality?

Hence appears the great usefulness of examining mineral waters in concert; for as various accidental circumstances give occasion to different appearances, the examination of a competent number and variety of them, helps to supply the defects in the histories of some of them. And, if this were further prosecuted, I doubt not but sulphur in substance might be obtained from several of them, as well as from Aix; which is therefore recommended to physicians and naturalists.

So much may suffice concerning such waters, wherein sulphur is the predominating ingredient; but there are others, wherein there are strong indications of its presence in a smaller proportion, and mixed with other minerals; and indeed, perhaps, few waters are without an admixture of it; for, beside several plain waters, especially such as contain the native alkali, and the purging waters, sea-water, the brine-springs, and the chalybeate waters, all which manifest a fetor by putrefaction, and some of them there-upon the like discolourations of metals as the sulphureous waters, the chalybeate waters, in particular, manifest a sulphureous admixture, by the cream, which they throw up to the surface, the various colours whereof, and its discolouring metals, are marks of sulphur.

There are, moreover, several other waters, even some of those, which otherwise make the nearest approach to pure element, having very little salts or earth, which I have mentioned in the beginning of this work, which also give strong suspicions of some degree of a sulphureous impregnation, by the purple and black sediments precipitated from them by solution of silver; which are eminently confirmed by a late examination of the celebrated Holy wells at Malvern, published in the 50th volume of the Transactions, and there extolled for many cures; which, altho' they do not yield quite a grain of solid contents from a pint upon evaporation, give three evidences of sulphur.

1. The purple powder precipitated from them by solution of silver. 2. In exhaling the water slowly in a silver vessel, the bottom of the vessel was tinged

of a pale yellow colour, as if it had been gilded. 3. When exhaled almost to a dryness, it emitted vapours of the smell of burning brimstone.

And lastly, besides all these, I have frequently remarked of several other waters, here and there mentioned in this work, that their sediments, obtained by evaporation, did manifest some pittance of this mineral, by the fetor they acquired on being rubbed with salt of Tartar; which, in the language of our author above-mentioned, being attracted by the acid, the phlogiston is let loose.

I have above recommended the farther investigation of sulphur as a desideratum in the history of mineral waters; and shall now beg leave to conclude this paper with the mention of two or three more articles, which greatly want further elucidation.

The first is alum, which, although hitherto found but in extremely few waters, and chiefly in those of Nevil Holt, Ballycastle acid water, and perhaps in the Hartfell water in Scotland, above-mentioned, according to some late experiments; yet the genuine crystals of alum have not as yet been satisfactorily demonstrated in any of these.

The second is the volatile mineral alkali, which the nitre of the ancients contained; and some of our mineral waters here and there give strong suspicions of, by the experiments with a mixture of quick-lime, and of the solution of mercury sublimata corrosive: but this matter greatly merits farther inquiry, and several difficulties attending it remain necessary to be explained.

Thirdly, the hint lately given in the 49th Vol. Part. II. of the Transactions, of the efficacy of the



Carolsbadt water, as superior to lime-water, in dissolving stones out of the body, if confirmed by correspondent events in the internal use, would be a discovery of the greatest moment, and highly deserves to be prosecuted.

I shall only observe here, that the principal minerals impregnating it are a native alkaline salt, and a calcarious earth; and that the Aix la Chapelle waters are not without such a salt and earth also, and, which is of more moment, they are reported, by long taking, to render the urine alkaline, even as do the Carolsbadt waters; and we are also told, that calculi, macerated twenty-four hours in the water of Aix la Chapelle, have been reduced to a sand, or soft consistence: but how far this last, the Selters, the Bourne waters, or our Tilbury water, or others alike impregnated, may participate of a like virtue, must be determined by further observation and experience.

Dublin, the 24th 3d mo. 1759.

XXIX. *An Account of the Effects of a Storm of Thunder and Lightning at Rickmansthworth, in Hertfordshire, on the 16th of July, 1759: In a Letter from Mrs. Anne Whitfeld. Communicated by Mr. John Van Rixtel, F. R. S.*

S I R,

Rickmersthworth, Oct. 22, 1759.

Read Nov. 15,  
1759.

**M**Y son not being at home, I have taken upon me to comply with your request, in giving you an account of the damages  
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